

Scanning Kelvin Probe Force Microscopy Study on Hydrogen Distribution in Austenitic Stainless Steel

Zhengli Hua ^{a,b}, Chaohua Gu ^a, Bai An ^b, Takashi Iijima ^b, Jinyang Zheng ^a

^a Institute of Process Equipment, Zhejiang University

^b National Institute of Advanced Industrial Science and Technology

Understanding the localized hydrogen distribution and trapping in austenitic stainless steel are important basis to study its hydrogen embrittlement mechanism. In this work, the hydrogen distribution testing method by SKPFM is optimized firstly. Then, the hydrogen distribution in the as-received austenitic stainless steel (γ -SS) and γ -SS with strain-induced martensite were studied. The results show that the high spatial resolution and imaging capability of SKPFM make it a useful tool to study hydrogen distribution and trapping sites in metals, while the influences of testing atmosphere and parameters shall be taken care of. The hydrogen diffusivity in γ -SS depends on the crystallographic orientation. The hydrogen diffusion out from (001) and (101) grains is faster than from (111) grains while no obvious difference is found between (001) and (101) grains. In addition, hydrogen is proved to be trapped at the phase boundary between austenite and martensite in γ -SS by SKPFM.